

The Vulnerable and Endangered Plants of Xishuangbanna Prefecture, Yunnan Province, China

Zou Shou-qing

Efforts are now being taken to preserve endangered species in the rich tropical flora of China's "Kingdom of Plants and Animals"

Xishuangbanna Prefecture is a tropical area of China situated in southernmost Yunnan Province, on the border with Laos and Burma. Lying between 21°00' and 21°30' North Latitude and 99°55' and 101°15' East Longitude, the prefecture occupies 19,220 square kilometers of territory. It attracts Chinese and non-Chinese botanists alike and is known popularly as the "Kingdom of Plants and Animals." The Langchan River passes through its middle.

Xishuangbanna is very hilly, about 95 percent of its terrain being hills and low, undulating mountains that reach 500 to 1,500 meters in elevation. The highest peak is 2,400 meters in elevation. High mountains in the north, including the Wuliang and Ailao Mountains, block the cold air from the north and trap warm, humid air from the Indian Ocean, creating a hot, humid, windless tropical climate. The mean annual temperature is 18 C to 22 C, and, depending upon elevation and topography, 1,000 millimeters to 2,200 millimeters of precipitation fall annually; as a result, tropical forest and other tropical vegetation flourish on hillsides and in valleys. A great diversity of vegetation types—including tropical rain forest, seasonal rain forest, montane rain forest, and evergreen

broadleaf forest—occurs in Xishuangbanna. Coniferous forest develops above 1,200 meters. In addition, Xishuangbanna lies at the transitional zone between the floras of Malaya, Indo-Himalaya, and South China and therefore boasts a great number of plant species. So far, about 4,000 species of vascular plants have been identified. This means that Xishuangbanna, an area occupying only 0.22 percent of China, supports about 12 percent of the species in China's flora. The species belong to 1,471 genera in 264 families and include 262 species of ferns in 94 genera and 47 families, 25 species of gymnosperms in 12 genera and 9 families, and 3,700 species of angiosperms in 1,365 genera and 208 families.

The tropical features of Xishuangbanna's flora are quite distinct. Such tropical families as the Dipterocarpaceae, Myristicaceae, Tetramelaceae, Anonaceae, and Dilleniaceae, and such genera as *Ficus*, *Artocarpus*, *Antiaris*, *Dysoxylum*, and *Aphanamixis* are represented. About 60 percent of the species in Xishuangbanna's flora also occur in Vietnam, Laos, Burma, and India. During the past two centuries, many species from the Indochinese peninsula and other tropical regions have been successfully introduced into Xishuangbanna. Among them have been *Cassia siamea*, *Mesua ferrea*, *Crinum asiaticum*, *Cananga odorata*, and *Bixa orellana*.

There are many endemic species in Xishuangbanna's flora, such as *Manglietia wangii*, *Polyalthia cheliensis*, *Phœbe puwen-*

Cycas pectinata Griffith, a rare and vulnerable species. It is a spectacular ornamental plant, and its fruit and stem are used in medicine by the Dai minority of China. Photographs by the author.

sis, and *Horsfieldia tetratepala*; a number of relict species, such as *Cycas pectinata*, *Podocarpus wallichii*, *Magnolia henryi*, and *Sladenia celastriifolia*; and many rare species, such as *Manglietia fordiana*, *Michelia hedyosperma*, *Paramichelia baillonii*, and *Pseuduvaria indochinensis*. According to data collected by Li Yanhui, 153 endemic species, 31 relict species, and 133 rare species grow in Xishuangbanna; of them, 110 are endangered or vulnerable (see the list on pages 6 and 7).

Twenty-eight wild types of cultivated plant species and their relatives occur in Xishuangbanna's flora, among them *Oryza minuta*, *Camellia sinensis* var. *assamica*, *Coix lacryma-jobi*, *Citrus grandis*, and *Momordica subangulata*. Some may prove to have significant value in genetic research and breeding.

More than 1,000 species in Xishuangbanna's flora are economically important. About 500 of them are medicinal plants that are used locally or in traditional Chinese medicine; among these are *Amomum villosum*, *Taraktogenos merrillana*, *Cissampelos paraira* var. *hirsuta*, and *Homalomena occulta*. *Rauvolfia yunnanensis* has become an important source of reserpine, and *Maytenus hookeri* is alleged to have anti-cancer properties.

More than 100 species of tree in Xishuangbanna's flora grow fast or produce high-quality timbers, the best example being *Dalbergia fusca* var. *enneandra*, which has purple-black heartwood. Its wood is very hard, heavy, and tough and so is used as a substitute for rosewood. The fast-growing species *Anthocephalus chinensis* is another example. It is the most productive timber tree in tropical tree plantations. *Toona ciliata*, *Paramichelia baillonii*, *Gmelina arborea*, *Altingia excelsa*, *Chukrassia tabularia* var. *velutina*, and *Dysoxylum bineceæfolium* are all valuable hardwood timber trees that are used in industry and construction.

Xishuangbanna's flora contains more than 100 oil-bearing species. *Horsfieldia tetratepala*, *Jatropha cureas*, *Hodgsonia macro-*

carpa, *Ostodes katharinæ*, and *Pyrularia edulis*, for example, are important sources of food oil or industrial oil. Ten species—*Calamus flagellum*, *Calamus palustris*, *Calamus nambariensis*, etc.—yield rattan. Many species are aromatic, tanning, or resin and gum plants, among them *Elsholtzia blanda*, *Cinnamomum mollifolium*, *Phyllanthus emblica*, and *Sterculia villosa*.

During the past 20 years, many forests in Xishuangbanna were ruined. More than 13,000 hectares of forest were cut each year as a result of shifting cultivation, conversion to rubber plantations, and demands for timber and fuel by local people. Recently, the forest cover of Xishuangbanna has declined sharply, from about 60 percent to 33 percent. Many hillsides that once were covered with rain forests are now grassland of cogongrass and low shrub. Along with the destruction of tropical forests, obviously, many plant and animal species have been threatened. It is estimated that one species is lost for every 700 hectares of tropical forest ruined. If this is so, then more than 800 species of plant have been lost or are in danger of being lost. If remedial measures are not taken today, many species with valuable properties will be lost. This would be a big mistake, one that our descendants would be unlikely to forgive.

The first volume of the *Plant Red Data Book for China*, recently issued by the Academia Sinica (the Chinese Academy of Science), lists 389 endangered species of Chinese plants. The *Book* gives their morphological features, distributions, and statuses and describes methods for their conservation. Fifty-four of the species it lists are native to Xishuangbanna.

The Chinese government devotes more attention to nature conservation now than it once did. For example, 310 nature reserves, with a total area of 167,000 square kilometers, have been established throughout the country, and the funding of nature-conservation programs has been increased. In Xishuangbanna Prefecture, some 600,000 hectares of tropical forest survive. To protect re-

maining ecosystems and species, 200,000 hectares of land (about one tenth the prefecture's area) have been set aside as reserves, including the Mengyang, Mengla, Menglun, Menghai, and Dashujiao reserves, and a team of 150 forest guards has been organized. The guards patrol forests, prevent

forest fires, stop hunting and timbering within nature reserves, and deal with criminal cases of vandalism.

The Yunnan Institute of Tropical Botany, Academia Sinica—formerly the Botanical Garden of Xishuangbanna—is located in the prefecture. It has become an active center



Caryota urens Linnæus, the wine (or sago) palm, is an endangered species in China. The Dai minority use the tasty starch in the middle of the trunk for food.

for the study and conservation of tropical plants. More than 2,500 local and otherwise tropical plant species, including dozens of endangered species, have been introduced and cultivated there.

Xishuangbanna is a treasure house of natural resources. Its flora, one of the richest in

China or for that matter in the world, contains many rare, endemic, and economically valuable species. A veritable treasury for our well-being, it has suffered seriously in the past. We must now work hard to prevent further losses to it.

Vulnerable and endangered members of Xishuangbanna's flora

(The symbols indicate that a species is vulnerable (*) or endangered (☞); species listed as endangered in the *Plant Red Data Book for China* are printed in boldface type.

Relict species

- * *Alsophila spinulosa* (Wallich ex Hooker) Tryon
- * *Cycas pectinata* Griffith
- * *Anchangiopteris henryi* Christ & Giesenhagen
- * *Cycas siamensis* Miquel
- * *Podocarpus imbricata* Blume
- ☞ *Podocarpus wallichii* Presl
- ☞ *Podocarpus fleuryi* Hickel
- * *Podocarpus nerrifolia* Wight
- ☞ *Cephalotaxus oliveri* Masters
- Magnolia henryi*** Dunn
- * *Sladenia celastrifolia* Kurz
- * *Cenocentrum tonkinense* Gagnepain
- ☞ *Borthwickia trifoliata* W. W. Smith
- * *Silvianthus bracteata* Hooker f. fil.
- * *Pittosporopsis kerrii* Craib
- * *Cephalostigma hookeri* C. B. Clarke
- * *Campanumœa parviflora* (Wallich) Benth.
- ☞ *Zippelia begoniæfolia* Blume

Endemic species

- * *Manglietia wangii* Hu
- * *Manglietia microgyna* Liou
- ☞ *Magnolia delavayi* Franchet var. *albivillosa* Liou
- ☞ *Cyathocalyx yunnanensis* Y. H. Li & P. T. Li
- ☞ *Cyathostemma yunnanensis* Hu
- * *Desmos yunnanensis* (Hu) P. T. Li
- ☞ *Coniothalamus chinensis* Hu
- ☞ *Cinnamomum austroyunnanensis* H. W. Li

- * *Cinnamomum mollifolium* H. W. Li
- Litsea dillenizæfolia*** P. Y. Bai & P. H. Huang
- ☞ *Neolitsea menglaensis* Yang & P. H. Huang
- * *Horsfieldia pandurifolia* Hu
- ☞ *Horsfieldia tetratepala* C. Y. Wu
- * *Myristica yunnanensis* Y. H. Li
- ☞ *Anemone filisecta* Wu & Wang
- ☞ *Capparis fohaiensis* B. S. Sun
- ☞ *Xanthophyllum yunnanensis* C. Y. Wu
- * *Heliciopsis lobata* (Merrill) Slaum var. *microcarpa* C. Y. Wu & T. Z. Hsu
- Heliciopsis terminalis*** (Kurz) Sleumer
- Homalium laoticum*** Gagn. var. *glabretum* C. Y. Wu
- * *Parashorea chinensis* Wang Hsie
- ☞ *Pellacalyx yunnanensis* Hu
- ☞ *Camellia taheishangensis* F. S. Zhang
- ☞ *Garcinia lancilimba* C. Y. Wu ex Y. H. Li
- ☞ *Garcinia xishuangbannaensis* Y. H. Li
- ☞ *Ochrocarpus yunnanensis* H. L. Li
- ☞ *Grewia falcata* C. Y. Wu
- ☞ *Sloanea cheliensis* Hu
- ☞ *Pterospermum yunnanensis* Hsue
- ☞ *Pterospermum mengluensis* Hsue
- * *Ostodes kuangii* Y. T. Chang
- * *Sauropus coriaceus* C. Y. Wu
- * *Lithocarpus yiwuensis* Huang & Y. T. Chang
- * *Maytenus diversicymosa* S. J. Pei & Y. H. Li
- * *Maytenus pseudoracemosa* S. J. Pei & Y. H. Li
- ☞ *Maytenus inflata* S. J. Pei & Y. H. Li
- ☞ *Maytenus pachycarpa* S. J. Pei & Y. H. Li

- ☞ *Protium yunnanensis* (Hu) Kalkm.
 * *Amoora calcicola* C. Y. Wu & H. Li
 * *Walsura yunnanensis* C. Y. Wu
 ☞ *Buchanania yunnanensis* C. Y. Wu
 * *Mastixia caudatilimba* C. Y. Wu
 ☞ *Nyssa sinensis* Oliv. var. *oblongifolia* Fang & Soong
 Nyssa yunnanensis W. C. Yin
 ☞ *Diospyros atrotricha* H. W. Li
 ☞ *Marsdenia incisa* P. T. Li & Y. H. Li
 * *Kopsia officinalis* Tsiang & P. T. Li
 * *Radermachera microcolyx* C. Y. Wu & W. C. Yin
 ☞ *Callicarpa yunnanensis* W. Z. Fang
 * *Salvia fragarioides* C. Y. Wu
 * *Arisæma austroyunnanensis* H. Li
 * *Achasma yunnanensis* T. L. Wu & Senjen
- Rare species**
 * *Manglietia fordiana* Oliver
 ☞ *Michelia hedyosperma* Law
 ☞ *Mitrephora wangii* Hu
 * *Litsea magnoliaefolia* Yang & P. H. Huang
 Litsea pierrei Lecomte var. *szemaonis* Liou
 * *Machilus rufipes* H. W. Li
 ☞ *Knema cinerea* Warburg var. *glauca* Y. H. Li
 ☞ *Horsfieldia kingii* (Hooker f.) Warburg
 Fleutharrhane macrocarpa (Diels) Formanék
 ☞ *Piper pubicatum* C. de Candolle
 ☞ *Argemone mexicana* Linnæus
 ☞ *Lagerstræmia intermedia* Koehne
 ☞ *Crypteronia paniculata* Blume
 ☞ *Cochlospermum vitifolium* Sprengel
 * *Aquilaria sinensis* (Loureiro) Gilg
 ☞ *Zanonia indica* Linnæus
 Tetrameles nudiflora R. Brown
 Terminalia myriocarpa Heurck & Müller
 Argoviensis
 Anogeissus acuminata (Roxburgh ex de Candolle) Guillaumin var. *lanceolata* Wallich ex Clarke
 ☞ *Quisqualis caudata* Craib
 ☞ *Combretum olivæforme* Chao
 Carallia lancæfolia Roxburgh
 * *Calophyllum polyanthum* Wallich ex Choisy
 Mesua nagassarium (Burman f.) Kostermans
 ☞ *Colona sinica* Hu
 ☞ *Sloanea tomentosa* (Benth.) Rehder & Wilson
 ☞ *Pterygota alata* (Roxburgh) R. Brown
 * *Vatica xishuangbannaensis* G. D. Tao & J. H. Zhang
 ☞ *Pterospermum acerifolium* Willdenow
 * *Bombax insignis* Wallich

- * *Hibiscus austroyunnanensis* C. Y. Wu & K. M. Feng
 * *Erythroxylum kunthianum* (Wallich) Kurz
 Ixonanthes cochinchinensis Pierre
 ☞ *Chætocarpos castanocarpus* Thwaites
 Dalbergia fusca Pierre
 * *Whitfordiodendron filipes* (S. T. Dunn) S. T. Dunn
 ☞ *Distilopsis yunnanensis* (H. T. Chang) C. Y. Wu
 * *Cyclobalanopsis rex* (Hemsley) Schott
 * *Trigonobalanus doichangensis* (A. Camus) Formanék
 * *Celtis wightii* Planchon
 * *Antiaris toxicaria* (Persoon) Leschenault
 Artocarpus lakocha Roxburgh
 Laportea urentissima Gagnepain
 Poikilospermum suaveolens (Blume) Merrill
 * *Maytenus hookeri* Loesener
 * *Garuga pierrei* Guillaumin
 Toona ciliata Roemer
 * *Toona microcarpa* (de Candolle) Harms
 Xerospermum bonii (Lecomte) Radlkofer
 Pometia tomentosa (Blume) Teysmann & Binnendijk
 ☞ *Nyctocalos shanica* MacGregor & W. W. Smith
 Gmelina arborea Roxburgh
 * *Homalomena gigantea* Engler
 * *Tacca chantrieri* André
 * *Caryota urens* Linnæus

Wild types of cultivated plants

- Oryza meyeriana* (Zollinger & Moritz) Baillon
 var. *granulata* Tataoka
Oryza minuta J. Presl
Camellia sinensis (Linnæus) O. Kuntze var. *assamica* (Masters) Kitamura
Litchi chinensis Sonnerat
Citrus grandis Osbeck
Mangifera sylvatica Roxburgh
 ☞ *Cucumis hystrix* Chakrav.
Panax zingiberensis C. Y. Wu & Feng ex C. Chow
Hovenia acerba Lindley var. *kiukiangensis* (Cheng & Hu) C. Y. Yu

Zou Shou-qing, a research associate at the Yunnan Institute of Tropical Botany, Academia Sinica, was exchange visiting scholar at the Arnold Arboretum of Harvard University in 1986. He received a B. A. degree in forestry in 1965 from the Nanjing Institute of Forestry.

More about the front cover

The illustration on the front cover of this issue of Arnoldia is part of a painting done in China nearly a century and a half ago by a Chinese artist working for the American merchant, Warren Delano (1809–1898), of Boston. Given in 1930 to the Arnold Arboretum by Delano's son, Frederic Adrian Delano, the painting is one of more than six hundred that the elder Delano commissioned during his two decades or more of residence in China. It depicts a rare Chinese shrub, Aquilaria sinensis (Loureiro) Gilg. The first excerpt printed below describes the paintings and gives details about Delano's gift to the Arboretum. The collection is far from unique, however, as the second excerpt attests.

Mr Frederic A. Delano has presented to the Library the most unique gift of recent years, to serve as a memorial to his father Warren Delano, 1809–1898, with the purpose of making it "of real value to students."

It consists of six hundred and eleven paintings of Chinese fruits, flowers and vegetables, natural size, beautifully executed by native artists on sheets 15" x 19". Some of them are well-known plants that have been introduced into this country such as the Rose, Peony, Chrysanthemum, Camellia, etc., but many of them are very rare. In his presentation letter Mr. Delano writes, "My father, Warren Delano, was one of the early Boston merchants engaged in the China trade—and went there in 1835. He lived in China for more than 20 years, between 1835 and 1866, chiefly in Canton, Macao and Hong Kong connected with the house of Russell & Co. During his stay he endeavored to learn about the products of the country and in the 40's he collected and had drawn by Chinese artists over 500 paintings of the 200 or more fruits, flowers and vegetables."

These paintings are replete with interest, botanical, artistic, and historical. They were apparently done by various artists with varying degrees of skill over a period of years. The paper on which they were painted is evidently of English manufacture, the earliest water-marks being "I. Taylor 1794" and "E. & P. 1794", and the latest "Ruse & Turners 1832." Between these are various other dates, many of which bear the name of J. Whatman, and in 1828, "J. Whatman, Turkey Mill" with design resembling a coat-of-arms.

The paintings are exquisitely drawn, in beautiful colors marvelously preserved, with details of

fruit and flower, some bearing both on the same plant. Occasionally two plants are figured on the same sheet.

—*Journal of the Arnold Arboretum*, Volume 11, Number 2 (April 1930), pages 131 and 132.

The Hort[icultural]. Soc[iety]. of London is indebted to J[ohn] Reeves for a fine collection of coloured drawings of Chinese plants, executed in his own house under his superintendence by Chinese draughtsmen. Such drawings first brought us to a knowledge of the *Chinese Prime rose*..., *Dendrobium nobile*, many of the finest *Camellias*, *Chrysanthemums*, *Azaleas*, *Moutans*, and above all of the *Glycine (Wistaria) chinensis*, which plants were subsequently introduced into English gardens. In this way was formed that collection of authentic drawings of Chinese plants, by far the most extensive in Europe, which now forms part of the library of the Horticultural Society.

A similar collection is now in the British Museum. Mr. Carruthers, Report Bot. Dep. Brit. Mus. for 1877, states that 654 Chinese drawings of plants, executed under the superintendence of the late John Reeves, were presented by Miss Reeves (his daughter or perhaps grand daughter).

—*History of European Botanical Discoveries in China*, by Emil Bretschneider, Volume 1, pages 257 and 258.